

REMARKS

Favorable reconsideration of this application, in light of the following discussion, is respectfully requested.

Claims 1-21 are pending. No claims are added, cancelled or amended. Therefore, no new matter is introduced.

In the outstanding Office Action, Claims 1-2, 5, 7-10 and 18-21 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sakakima (U.S. Patent No. 6,005,798) in view of Nickel (U.S. Patent No 5, 835,003); Claims 3-5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sakakima in view of Nickel and Chang (U.S. Patent No. 5,294,287); Claims 11-12 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sakakima in view of Nickel and Wang (U.S. Patent No. 6,713,195); and Claims 14-17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sakakima in view of Nickel and Zhu (U.S. Patent No. 5,734,605).

Initially, the rejection of Claims 1-2, 5, 7-10, and 18-21 as being unpatentable over Sakakima in view of Nickel is respectfully traversed.

Claim 1 is directed to a current injection-type magnetic domain wall-motion device, and recites:

*a first magnetic body directly adjacent to a third magnetic body and a second magnetic body directly adjacent to the third magnetic body, the second magnetic body having a magnetization direction antiparallel to that of the first magnetic body, a first microjunction interface between the first and the third magnetic bodies, and a second microjunction interface between the third and the second magnetic bodies, wherein*

the magnetization direction of the third magnetic body is controlled in such a manner that *a current is applied to pass through the first and second microjunction interfaces*, such that a magnetic domain wall present between the first and second magnetic bodies is moved within the third magnetic body in the same direction as that of the current or in the direction opposite to that of the current by the interaction between the magnetic domain wall and a direct flow of the current. (Emphasis added.)

Thus, Claim 1 defines that a first magnetic body is directly adjacent to a third magnetic body and that a second magnetic body is also directly adjacent to the third magnetic body, such that the third magnetic body is sandwiched between the first and second magnetic bodies *with no other body therebetween*. Further, Claim 1 also defines that the magnetization direction of the third magnetic body is controlled by direct flow of a current that passes through the junctions between the magnetic bodies. In other words, the current passes through all three magnetic bodies. It is believed that no cited reference discloses or suggests these features.

For example, Sakakima describes a magnetoresistance element (11) in which a soft magnetic film (3) is adjacent to a non-magnetic film (2) and a hard magnetic film (1) is adjacent to the non-magnetic film (2).<sup>1</sup> Thus, Sakakima describes that the non-magnetic film (2) is sandwiched between the soft magnetic film (3) and the hard magnetic film (1).<sup>2</sup> Sakakima also describes that a conductor line (5) is disposed “in the vicinity” of the magnetoresistance element (11) with an insulating film (6) between the magnetoresistance element (11) and the conductor line (5).<sup>3</sup> In operation, Sakakima describes that the current flow through the conductor line (5) results in a magnetic field that inverts the magnetization of the soft magnetic film (3).<sup>4</sup>

However, Sakakima does not describe that the resistance element (11) includes only magnetic materials. Instead, Sakakima describes that each of the magnetoresistance elements (11) includes a non-magnetic film (2) between the hard and soft magnetic films (3, 1).<sup>5</sup> Sakakima describes that the non-magnetic film is necessary in order to reduce the force of the magnetic coupling between the hard and soft magnetic films (1, 3).<sup>6</sup> Thus, while Sakakima

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<sup>1</sup> Sakakima at column 1, line 58 - column 12, line 19; see also Figure 1.

<sup>2</sup> Id.

<sup>3</sup> Sakakima at column 13, lines 45-54; see also Figure 4.

<sup>4</sup> Sakakima at column 14, lines 24-38.

<sup>5</sup> Sakakima at column 11, line 58 - column 12, line 19.

<sup>6</sup> Sakakima at column 12, lines 13-18.

may illustrate multiple magnetoresistance elements (11) stacked on each other, each one of these elements includes a non-magnetic film (2) between two magnetic films (1, 3).

Conversely, Claim 1 recites a first magnetic body directly adjacent to a third magnetic body and a second magnetic body directly adjacent to the third magnetic body where a first microjunction interface exists between the first and third magnetic bodies, and a second microjunction interface exists between the third and second magnetic bodies, and the magnetization direction of the third magnetic body is controlled by a current that is applied to pass through both microjunction interfaces. Therefore, Sakakima fails to disclose the first, second and third magnetic bodies as recited in Claim 1.

Furthermore, Sakakima fails to disclose that the current through the conductor line (5) passes through any of the junctions between the soft magnetic film (1) and the non-magnetic film (2) or the non-magnetic film (2) and the hard magnetic film (3). Instead, Sakakima clearly describes that the conductor line (5) is separated from the magnetoresistance elements (11) by an insulator (6).<sup>7</sup> Therefore, no current flowing through the conductor (5) can pass through the films (1, 2, 3), much less through any junction therebetween. Conversely, amended Claim 1 recites that the magnetization direction of the third magnetic body is controlled in such a manner that *a current is applied to pass through the first and second microjunction interfaces* such that a magnetic domain wall is moved *according to a direct flow of the current*. Thus, Sakakima also fails to disclose the claimed magnetic domain wall and current flow of Claim 1.

Nickel generally describes a colossal magnetoresistance (CMR) sensor that responds to low fields emanating from recording media.<sup>8</sup> Specifically, Nickel describes that the CMR sensor (200) includes a first magnetic layer (202) and a second magnetic layer (206) between

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<sup>7</sup> See, for example, Fig. 4 of Sakakima.

<sup>8</sup> Nickel at column 2, lines 30-35.

which a CMR layer (204) is positioned.<sup>9</sup> Nickel describes that the first and second magnetic layers (202), (206) control the field penetrating through to the CMR layer (204).<sup>10</sup> However, Nickel does not describe domain wall motion via direct current flow. In fact, Nickel describes a device that is quite different from that of Sakakima and that recited in Claim 1. As such, Nickel does not cure the above-discussed deficiencies in Sakakima, and no combination of Sakakima and Nickel describes every feature recited in Claim 1. As such, Claim 1 is believed to be in condition for allowance, together with any claim depending therefrom. Accordingly, it is respectfully requested that the rejection of Claims 1-2, 5, 7-10 and 18-21 under 35 U.S.C. § 103(a) be withdrawn.

As all other rejections of record rely upon Sakakima and Nickel for describing the above-distinguished features, and the above-distinguished features are not disclosed in Sakakima or Nickel, alone, in combination, or in combination with any other art of record, it is respectfully submitted that *prima facie* case of obviousness cannot be maintained. Accordingly, it is respectfully requested that the rejection of Claims 3-4, 6 and 11-17 under 35 U.S.C. § 103(a) be withdrawn.

For the reasons discussed above, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal allowance. Therefore, a Notice of Allowance for Claims 1-21 is earnestly solicited.

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<sup>9</sup> Nickel at column 4, lines 10-22; see also Figure 2.

<sup>10</sup> Nickel at column 4, lines 49-60.

Should, however, the above distinctions be found unpersuasive, Applicants respectfully request that the Examiner provide an explanation via Advisory Action under M.P.E.P. § 714.13 specifically rebutting the points raised herein.


Respectfully submitted,

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